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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/500,053	06/24/2004	Mordechai Forkosh	055/04085	9159

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EXAMINER	
NALVEN, EMILY IRIS	
ART UNIT	PAPER NUMBER
3744	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/500,053	FORKOSH ET AL.	
	Examiner	Art Unit	
	EMILY I. NALVEN	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 August 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-10,25-30,32,34,36-38 and 70-82* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 4-10, 25-30 and 70-82* is/are rejected.

7)☐ Claim(s) *32,34 and 36-38* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Receipt of Applicant's amendment filed on August 13, 2007 is acknowledged. As claim 6 was not addressed in the previous Office Action and the limitation of a desiccant pump was not properly addressed in claim 9, a new non Final Office Action is being presented to the Applicant.

Claim Objections

2. **Claims 4-10, 25-30, 32, 34, 36-38, 74-77 and 79-82** are objected to because of the following informalities:

In regard to claims 4-10, 74-77 and 79-82, the recitation "An air-conditioning" (lines 1, respectively) should be changed to -- The air-conditioning -- to further clarify the limitations of the claim.

In regard to claims 25-26, 28-31, 34 and 36-38, the recitation "A system" (lines 1, respectively) should be changed to -- The system -- to further clarify the language of the claim.

In regard to claim 27, the recitation "A dehumidifier" (line 1) should be changed to -- The dehumidifier -- to further clarify the language of the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 4-10 and 72-82 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson (US 4,955,205) in view of Forkosh et al. (US 6,494,053 B1).

In regard to claim 1, Wilkinson discloses a dehumidifier (apparatus) that produces dehumidified air and utilizes a liquid desiccant for drying (as seen in Figure 3), the dehumidifier comprising a liquid desiccant (72, 74, 78 - desiccant solution; Figures 3, 5, 10) in two reservoirs (as seen in the illustration of Figure 3 below), one of which contains a higher desiccant concentration than the other (see col. 5, line 60 - col. 6, line 13); a dehumidifier unit (13 - liquid desiccant dehumidification subsystem) into which moist air is introduced and from which less moist air is removed after dehumidification by liquid desiccant transferred thereto (see col. 4,' lines 49-60; Figure 3); a regenerator unit (12 -absorption chiller refrigeration subsystem) which receives desiccant solution that has absorbed from the moist air and removes moisture from it (see col. 4, line 61 - col. 5, line 11; Figure 4); and a passageway (23 - heat exchanger), connecting the reservoirs (as seen in the illustration of Figure 3 below), a cooling tower (21 - cooling tower) that provides at least one non-desiccant fluid (water) at a temperature lower than the temperature of the liquid desiccant in one of the reservoirs (see col. 5, lines 39-50; Figure 3); and at least one heat exchanger (29 - cooling coils) situated in the one reservoir via which the liquid desiccant in the one reservoir is cooled by the at least one fluid (see col. 5, lines 39-50; Figure 3).

Wilkinson does not expressly disclose details related to the steady state operation of the system. Forkosh et al. teach of a combined dehumidification and air conditioning system that is comprised Forkosh et al. further disclose that the system is comprised of a dehumidifying chamber (12) and regenerator chamber (32) that are mounted next to one another (as seen in Figure 4). Further disclosed is that the sumps/reservoirs (30A, 30B) of the respective chambers are in fluid communication with one another via an aperture (202) (see col. 11, lines 38-54; col. 12 lines 7-24; Figure 4). Further disclosed is that during steady state operation, there is a net flow of moisture via the passageway between the two reservoirs. In addition, Wilkinson further discloses that during steady state operation, there is not a net flow of desiccant ions passed between the two reservoirs (see col. 12, lines 7-24). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Forkosh et al. by incorporating the system's steady state characteristics, as taught by Wilkinson, so that the efficiency and drying capacity of the regeneration is maintained (see col. 10 line 62 - col. 11, line 5; col. 12, lines 7-24), thus ensuring that the system operates efficiently and is cost effective.

In regard to claim 4, Wilkinson discloses said cooling tower comprises at least one cooling chamber (volume enclosed within cooling tower [21]; Figure 3) through which air flows (as seen in Figure 3), and which contains water which evaporates into said air (the water that is circulated through the cooling tower

[21], loop [27] and cooling coil [29] is capable of being evaporated by the ambient atmospheric air that passes through the cooling tower; col. 2, lines 39-50; Specification, page 6, lines 16-20), wherein the at least one fluid comprises one or both of air exiting at least one of the at least one cooling chambers and water cooled in at least one of the at least one cooling chambers (as seen in Figure 3). **In regard to claim 5,** Wilkinson discloses the water in at least one of the at least one cooling chambers is dispersed into the air in said cooling chamber (as seen in Figure 3). Wilkinson does not expressly disclose that the water within the cooling chamber is sprayed into the air that passes through the chamber. However as seen in Figure 3, Wilkinson discloses the use of two sprayers to dispense desiccant within the system's subsystems.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Wilkinson by incorporating a sprayer to spray the cooling tower's water into the air that passes through the cooling tower, so that the water is capable of being more evenly dispersed with the ambient air, thus increasing the cooling tower's efficiency.

In regard to claim 6, Wilkinson teaches some of the air flowing through the at least one of the cooling chambers comprises at least some of the dehumidified air produced by the dehumidifier (13) (col 4 lines 53-58 and col 5 lines 12-15).

In regard to claim 7, Wilkinson discloses at least some of the air flowing through at least one of the at least one cooling chambers comprises air that has not been

dehumidified by the dehumidifier (dry air to building; Figure 10).

In regard to claim 8, Wilkinson discloses at least one of the at least one heat exchangers is in thermal contact with at least one of the at least one cooling chambers (in order for the cooling coil [29] to be utilized as a heat exchanger, it is obvious that the fluid circulated through the cooling coil [29] and cooling tower [21] must exhibit some sort of temperature gradient and thus, placing the cooling coil [29] and cooling tower [21] in thermal contact with each other; col. 5, lines 39-59; Figure 3).

In regard to claim 9, Wilkinson discloses a desiccant pump (35 - pump means) which pumps the desiccant through at least one of the at least one heat exchangers (23 - heating coil) (as seen in Figure 3 and col 5 lines 29-32).

In regard to claim 10, Wilkinson discloses a desiccant reservoir (34 - dehumidifier sump), wherein the liquid desiccant utilized by the dehumidifier is contained at least part of the time in the desiccant reservoir (see col. 5, lines 12-38), and at least one of the at least one heat exchangers is in thermal contact with the desiccant reservoir (cooling fluid is circulated from the cooling tower [21] to the cooling coil [29] via loop [27] wherein sprayed desiccant [33] exchanges heat with the cooling fluid, thus placing the cooling coils [29] in thermal contact with the liquid desiccant in the dehumidifier sump [34]; col. 5, lines 25-59; Figure 3).

In regard to claim 72, see the rejection for claim 73.

In regard to claim 73, Wilkinson teaches the at least one fluid comprises both of air exiting at least one of the at least one cooling chambers (21) and water cooled in at least one of the at least one cooling chambers (21) (col 5 lines 39-50).

In regard to claim 74, see the rejection for claim 6.

In regard to claim 75, see the rejection for claim 7.

In regard to claim 76, see the rejection for claim 8.

In regard to claim 77, see the rejection for claim 9.

In regard to claim 78, see the rejection for claim 1. Additionally, Wilkinson teaches said cooling tower (21) comprises at least one cooling chamber (passage 26 from fan 30 to coil 28 – see Fig. 3) through which air flows (see Fig. 3 and col 5 lines 39-46) wherein the at least one fluid comprises one or both of air exiting at least one cooling chambers and water cooled in at least one of the at least one cooling chambers (see Fig. 3 and col 5 lines 39-50) wherein at least some of the air flowing through the at least one of the at least one cooling chambers comprises at least some of the dehumidified air produced by the dehumidifier (13) (see Fig. 3 – air from heat exchanger 23 which is in direct relation to the dehumidifier 13 mixes with air from fan 30 contained in cooling tower 21).

In regard to claim 79, see the rejection for claim 5.

In regard to claim 80, see the rejection for claim 8.

In regard to claim 81, see the rejection for claim 9.

In regard to claim 82, see the rejection for claim 10.

5. **Claims 25-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilkinson as modified by Forkosh et al., and further in view of Saito (US 3,266,784).

Regarding claim 25, Wilkinson discloses a dehumidifying section (13- liquid desiccant dehumidification subsystem); a dehumidifying section reservoir of said at least two reservoirs containing at least some of the liquid desiccant (as seen in Figures 3, 5, 10).

Regarding claims 26 and 27, Wilkinson discloses a regenerating section (12 - absorption chiller refrigeration subsystem); a regenerating section reservoir of said at least two reservoirs containing at least some of the liquid desiccant (as seen in Figures 3, 5, 10).

Wilkinson as modified by Forkosh et al. do not expressly disclose dehumidifying or regenerating section elements and details related thereto.

Saito teaches of a dehumidification unit that is comprised of rotary drums (5, 6) that circulate liquid desiccant in and out of the unit's dehumidification and regeneration reservoirs (1, 2 - absorption tower, regeneration tower) (as seen in Figure 1). Saito further discloses that buckets (10) are attached on the absorbent tower's (1) rotary drum (5) (as seen in Figure 1). Further disclosed is that the rotation of the rotary drums is driven by an electric motor (see col. 2, lines 52-56; Figure 1).

Regarding claim 25, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Wilkinson as modified by Forkosh et al. by incorporating a rotary drum and buckets within the system's absorbent tower, as taught by Saito, so to increase the percentage of moisture that is absorbed from the air (see col. 3, lines 12-25), thus creating an environment that is more suitable and comfortable for occupants.

Regarding claims 26 and 27, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Wilkinson as modified by Forkosh et al. and Saito by incorporating a rotary drum and buckets within the system's regeneration tower, so to increase the percentage of moisture that is returned to the circulated air, thus providing a means of further balancing the concentration of desiccant ions between the respective reservoirs and improving the system's overall efficiency.

Regarding claim 28, it would have been obvious to one of ordinary skill in the art at the of time of the invention to modify the existing system of Wilkinson as modified by Forkosh et al. and Saito by rotating the absorption tower's rotary drum on a continuous basis, so to provide a means of consistently providing the desired air quality, thus making the system more reliable.

Regarding claims 29 and 30, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Wilkinson as modified by Forkosh et al. and Saito by rotating the absorption tower's rotary

drum on an intermediate basis, so to provide a means of adjusting the quality of the delivered air, thus making the system more user-compatible.

6. **Claims 70 and 71** are rejected under 35 U.S.C. 103(a) as being unpatentable over Forkosh et al. in view of Wilkinson.

Regarding claim 70, Forkosh et al. disclose a dehumidifier (200 - dehumidifier) that produces dehumidified air and utilizes a liquid desiccant for drying (as seen in Figure 4), the dehumidifier comprising a liquid desiccant (as seen in Figure 4) in two reservoirs (30A,30B - sumps), one of which contains a higher desiccant concentration than the other (see col. 11, lines 1-2); a dehumidifier unit (30B - sump) into which moist air is introduced and from Which less moist air is removed after dehumidification by liquid desiccant transferred thereto (see col. 12, lines 7-24; Figure 4); a regenerator unit (30A - sump) which receives desiccant solution that has absorbed from the moist air and removes moisture from it (see col. 12, lines 7-24; Figure 4); and a passageway (202 - aperture) connecting the reservoirs (as seen in Figure 4), via which passageway, during steady state operation of the dehumidifier, there is a net flow of moisture via the passageway from the reservoir having the lower desiccant concentration to the other reservoir (see col. 11, lines 37-54; col. 12, lines 7-24), wherein there is no pumping of liquid desiccant from one reservoir to the other (see col. 10, lines 52-56); at least one heat exchanger (102, 104 - conduit/heat exchanger) situated beside the one reservoir via which the liquid desiccant in the one reservoir is cooled by a fluid (refrigerant; col. 9, lines 38-50).

Regarding claim 71, Forkosh et al. disclose a majority of the recited limitations above in claim 70. However, Forkosh et al. do not expressly disclose a cooling tower and details related thereto, and at least one heat exchanger and details related thereto.

Wilkinson teaches of a hybrid air conditioning unit that is comprised of refrigeration and dehumidification subsystems, and cooling tower (as seen in Figure 3). Wilkinson further discloses that the cooling tower (21) circulates (via pump means [25]) water to the dehumidifier reservoir (15) through cooling coil (29) and loop (27) (see col. 5, lines 11- 50; Figure 3).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Forkosh et al. by incorporating a cooling tower to cool the system's dehumidification unit using water, as taught by Wilkinson, because of its abundance and easy accessibility, thus reducing the overall costs associated with operating the system.
It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the existing system of Forkosh et al. by incorporating the system's heat exchanger within the dehumidifier's reservoir, as taught by Wilkinson, so to increase the rate at which heat is transferred within the dehumidifier, thus providing a means of increasing the comfortable of the air that is supplied to a respective enclosure.

Allowable Subject Matter

8. **Claims 32, 34 and 36-38** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

9. Applicant's arguments filed on Aug. 13, 2007 have been fully considered but they are not persuasive. The Applicant Contends that the Wilkinson reference does not meet the newly added limitation to claim 1 that "at least one fluids comprise air." The Examiner points out that in an apparatus claim, functional language and the material being worked upon, is given little patentable weight. Additionally, ambient air from the fan 30 is used in the cooling tower 21 by the heat exchangers to evaporate and condense the refrigerant and liquid desiccant, thus playing a vital role and functioning as a non-desiccant fluid.

The Examiner acknowledges that the previous Office Action had indicated a water pump and not a desiccant pump in regard to claim 9. This has been amended. The Applicant also contends that there is no thermal contact between the reservoir and the heat exchangers in regard to claim 10. According to Fourier's law when two bodies come in contact, there is a thermal contact and transfer of heat. While the reservoir (34) and heat exchanger (23) are not touching each other per se, they do both come into direct contact with similar connecting valves. Therefore, there is thermal contact between the reservoir and heat exchanger via another medium.

In regard to claims 70 and 71, the it is interpreted that the heat exchanger 29 is part of the reservoir 34 system as the reservoir 34 receives the desiccant solution as a direct result of the functioning of the heat exchanger 29 in that desiccant from the sprayer 33 traverses across the heat exchanger 29 to enter the reservoir 34 (see Fig. 3 and col 5 lines 60-68 and col 6 lines 1-2).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Emily Iris Nalven whose telephone number is (571)272-3045. The examiner can normally be reached on Monday - Thursday 8 AM - 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisors, Cheryl J. Tyler can be reached on 571-272-4834 or Frantz Jules can be reached on 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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March 15, 2008

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